Joint Trauma System

Nutritional Support Using Enteral and Parenteral Methods

Part of the Joint Trauma System (JTS) Clinical Practice Guideline (CPG) Training Series

Purpose

These guideline aim to achieve optimal nutritional support for the critically injured or ill patient using enteral nutrition and parenteral nutrition methods.

This presentation is based on the JTS Nutrition Using Enteral Parenteral Methods 04 Aug 2016 CPG (ID:30). It is a high-level review. Please refer to the complete CPG for detailed instructions. Information contained in this presentation is only a guideline and not a substitute for clinical judgement.

Agenda

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Background

- Enteral nutrition (EN) should be the first choice over total parenteral nutrition (TPN) for patients unable to consume food on their own.
- **EN**: The use of the stomach, duodenum, or jejunum to provide the nutrition targets to optimize healing and normal physiologic function.
- **TPN**: Formulated nutritional substrate provided ***intravenously*** to optimize healing and normal physiologic function.
- When compared to parenteral nutrition, EN in appropriately selected patients has been associated with a decrease in infectious complications, decreased hospital length of stay and a significant reduction in ICU length of stay.

Nutritional Requirements

Nutritional requirements are based on the patient's current nutritional status and severity and type of trauma injuries.

- Use CPG-based guidelines.
- Do not increase caloric intake beyond below-calculate amounts.
- There is an increase in complications with overfeeding.

Nutritional Requirements

Enteral Feeding Calculations	
Body Mass Index (BMI)	(wt in kg) / (ht in m)^2
Ideal Body Weight (IBW)	Male: (50kg) + (2.3kg per inch over 5ft) Female: (45.5kg) + (2.3kg per inch over 5ft)
Kcal	High Stress Trauma/Burn: 25-35 kcal/kg/day dry wt
	Vent (>72 hours) or ARDS: 20-25 kcal/kg/day dry wt
	Obese (BMI>30): 22-25 kcal IBW or 11-14 kcal/day actual wt
Protein	Major Trauma/Burn/TBI: 1.5-2.0 g/kg/day *Large Burn may need up to 1.5-2.0 g/kg/day
	Obese (BMI>30): 2g/kg/day IBW
	Most patients: 1.2-1.5 g/kg/day
Fat	15-30% of kcal
	15-20% of kcal in major burns
Free Water	1ml/kcal

Nutritional Requirements

Vitamin and Trace Mineral Supplementation	
Continue for 7 days and then re-assess patient's clinical and nutritional condition. [1,18-20]	
****Closely Evaluate Dosing in Renal and Liver Failure patients.**	
Vitamin C	500 mg IV daily if CrCl<30ml/hour Note: Higher doses of Vitamin C may increase or contribute to diarrhea
Zinc Sulfate	220 mg tab by mouth once a day for no more than two weeks
Vitamin E	1000-1200 IU PO/OG/NG/NJFT every eight hours
Selenium	200 mcg IV or PO/OG/NG every 24 hours
Multivitamin Tab, Elixir, or IV once a day	Prenatal vitamins are often an excellent choice for supplementation if iron is also needed. For those unable to swallow a large pill or for whom the iron causes GI upset, children's chewable vitamins are well tolerated.

Nutritional Requirements

- Active duty population is often young, healthy, and muscular.
  - If BMI > 30 and muscular, use estimated actual weight pre-injury.
  - If BMI > 30 due to obesity, should use ideal body weight (IBW) when indicated.
- Use CPG-calculated nutritional requirements until back in CONUS or equivalent at which time more accurate caloric and macronutrient requirements can be calculated.
- If considering “hypocaloric feeding” for any reason, ensure adequate protein intake.

Nutritional Requirements

- Routine laboratory value monitoring recommendations:
  - Obtain a pre-albumin every Monday for those with ICU stays greater than 7 days.
  - Obtain liver function tests and lipid panels at baseline and every Monday for those on TPN.
- Other labs such as BMP, calcium, magnesium, etc., dependent on clinical situation and may be dictated by use of enteral or parenteral nutrition. Detailed guidance in Appendix of CPG.

Enteral Nutrition

Indications for Enteral Nutrition

- Any patient who is anticipated to remain unable to take full oral intake on their own for greater than 5 – 7 days
- Any patient who has inadequate oral intake to meet current nutritional needs
- Any patient with pre-existing malnutrition (>15% involuntary weight loss or pre-injury albumin < 3 g/dl) or categorized as “high nutritional risk” based on a validated nutritional risk scoring system and unable to immediately resume full oral intake.

Enteral Nutrition

Absolute Contraindications for Enteral Nutrition

- High risk for non-occlusive bowel necrosis
  - Active shock or ongoing resuscitation
  - Persistent mean arterial pressure (MAP) < 60 mm Hg
  - Increasing requirement for vasoactive support to maintain MAP > 60 mm Hg
- Generalized peritonitis
- Intestinal obstruction
- Surgical discontinuity of bowel
- Paralytic ileus
- Intractable vomiting/diarrhea refractory to medical management
- Known or suspected mesenteric ischemia
- Major gastrointestinal bleed
- High output uncontrolled fistula

Enteral Nutrition

Relative Contraindications for Enteral Nutrition

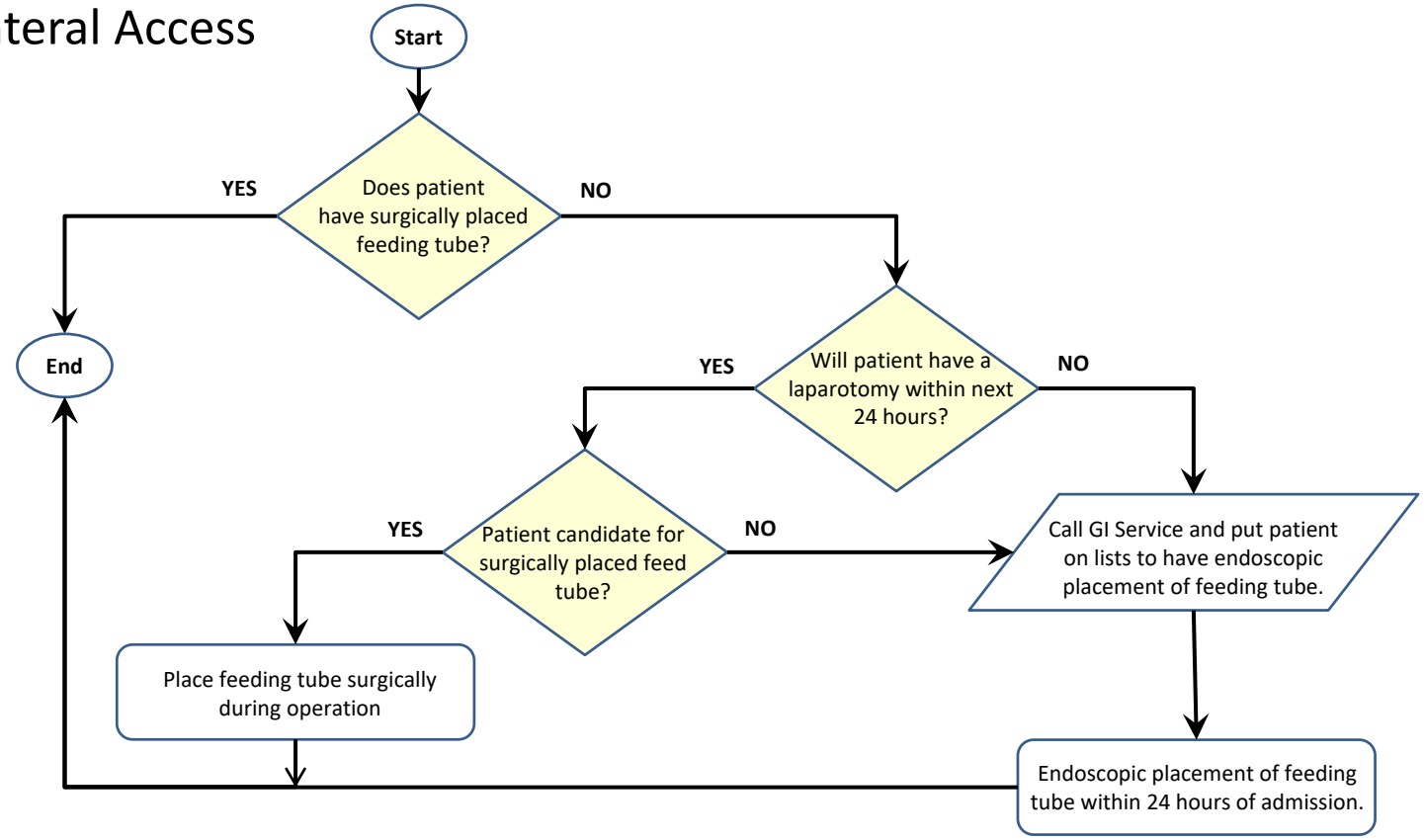
- Body temperature < 96 F
- Concern for abdominal compartment syndrome by bladder pressure > 25 mm Hg

Enteral Access

- Ideally, enteral access will be established within 24 hours of admission to the Role 3 or higher Medical Treatment facility (MTF).
  - If the patient taken to the OR for laparotomy, a naso-jejunal feeding tube (NJFT) should be placed while in the OR.
  - If not a candidate for operative placement, any other means should be used (i.e. endoscopic, fluoroscopic, etc.)
  - If unable to place NJFT, consider orogastric, or nasogastric tube.
  - If prolonged enteral feeding > 4 weeks is expected, a surgical feeding tube should be considered.

Enteral Access

Obtaining Enteral Access



Feeding Options

Gastric Feeds

- May be necessary, but is highly discouraged in combat trauma patients during periods of transport to CONUS.
- Considered in certain clinical scenarios, but should be discussed and coordinated between the attending trauma surgeon and entire multidisciplinary team.
- Use of pro-kinetic agents to maximize tolerance to enteral feeding should be attempted before cessation of enteral feeding.
- Gastric residual volumes may be utilized, but feeding should not be halted for values less than 500 cc.

Feeding Options

- Check gastric residuals every 4 – 8 hours if feeding through OG/NG tube, or if OG/NG tube is in place along with a post-pyloric/jejunal feeding tube. Reinfuse the entire gastric aspirate or administer an equivalent volume of ½ normal saline.
- If GRV > 300 mL on two consecutive checks, notify physician.
  - Start erythromycin 250 mg IV or oral every 6 hours or metoclopramide 10mg IV every 6 hours.
  - Continue every 4 hour residual checks.
  - Feedings should only be halted when ordered by a physician.

Feeding Options

Jejunal Feeds

- Maintain head of bed > 30 degrees at all times or in reverse Trendelenburg if spine not cleared.
- Obtain portable abdominal X-ray within 12 hours of any aeromedical movement to confirm feeding tube is within jejunum.
- Enteral nutritional administered into the jejunum does NOT need to be stopped prior to going to OR, CCAT/AE transport, lying flat, etc.
- Keep OG tube on intermittent low wall suction while initiating and advancing tube feeds via NJFT.

Feeding Options

- NJFT maintenance requires meticulous care to prevent clogging
- Clogging due to either lining of the NJFT with build-up of tube feeds or inappropriate medications
  - Recommend flush feeding tube with 20 ml of water or saline every 2 hours.
  - Flush an additional 20 ml ***before*** and ***after*** all medications are given.
  - No amount of pancreatic enzymes, cola, etc., is effective to maintain patency for extended periods so prevention is key.

Parenteral Nutrition

Indications for Parenteral Nutrition

- Unable to meet >50% of caloric needs through enteral route by post-injury day #7.
- Any of the contraindications for enteral nutrition persist and the patient is without nutritional support for 3 days.
- Patient not anticipated to start enteral nutrition for more than 3 – 5 days.
- Massive small bowel resection refractory to enteral feeds.
- High output fistula after failure of elemental diet.
- Any patient with pre-existing malnutrition or categorized as “high nutritional risk” based on validated nutritional risk scoring system with contraindication or intolerance to enteral feeding.

Parenteral Nutrition

- Be aware that Total Parenteral Nutrition (TPN) is often unavailable in a combat zone.
- If being used, ensure the patient has a clean, dedicated central line or peripherally-inserted central catheter (PICC) for administration of TPN.
- A 0.2 micron in-line filter should be used with non-lipid-containing TPN and a 1.2 micron filter used with any lipid-containing TPN.

Formula Selection

Multiple formula types are often available, each with their own specific uses to include, but not limited to:

- High protein, volume-concentrated formula (e.g., IMPACT®)
  Major trauma patients for first 7 days, malnourished patients, burn patients.

- Semi-elemental/elemental enteral formulas (e.g., Peptamen®, Vital®)
  Proven intolerance to first formula, persistent diarrhea, short bowel syndrome.

(continued)

Formula Selection

- Formula types (*continued)*:
  - Polymeric, fiber-free formula (e.g., Osmolite®)
    Patients with moderate protein needs and normal GI tract.
  - Polymeric with mixed fiber formula (e.g., Jevity®)
    Stable, long-term patients
- Fiber in formula is contraindicated in patients at risk for bowel ischemia or who are hemodynamically unstable, but otherwise can be added for stool management.

See full CPG for more details.

Enteral Nutrition Initiation

- Multiple things can interrupt feeding, and a protocol stressing volume rather than hourly rate should be used, to allow ICU nurse to adjust rates/bolus to make up for lost volume.
- When initiating and advancing enteral feeding, the following are general recommendations:
  1. Start enteral tube feed with full strength formula at 20 ml/hr.
  2. Increase rate by 20 ml/hr every 6 – 8 hours to goal rate if low risk for intolerance.
  3. If at high risk for intolerance, maintain trophic rate at 20-30 ml/hr for first 24 hours, then advance if well tolerated.
  4. For burn and head injury patients without abdominal trauma or other contraindications, advance 20 ml every 4 hours to goal rate.

Enteral Nutrition Initiation

Consider holding initiation of feeds until the patient will be at one location for at least 24 hours.

- When transferring patients from one level of care to another, it is difficult to monitor feeling tolerance.
- Risk of aspiration in an awake patient or intolerance in an intubated patient until repeated examinations confirm tolerance.

Supplementation

- Glutamine ***should not*** be utilized in the critically ill patient.
- Patients tolerating a regular diet are often subject to multiple restrictions to diet due to frequent procedures, medications, etc., and can benefit from supplements.
  - Recommend high-protein drinks (0.5 – 1.0 L per day) in addition to meals.
  - If nutritionally low risk patient, no evidence routine enteral supplementation beneficial if < 48 hours of NPO status.
  - Moderate and high nutritional risk patients can consider TPN if oral intake is inadequate or evidence of worsening nutritional values.

Medication Considerations

- Inotropic agents such as dobutamine or milrinone do not change feeding plan recommendations.
- If the patient is receiving paralytics and vasoactive agents such as dopamine, norepinephrine, etc., consider:
  - Elemental formula at 20 ml/hr and do not advance.
  - TPN starting post injury day 7 if not tolerating enteral feeds or goal rate.
  - Early initiation of TPN appropriate if high nutritional risk or pre-existing malnutrition.
  - Holding enteral feeding if adding or increasing vasopressor or persistent MAP < 60 mm Hg.

Bowel Regimen

- Patients on opioids, immobile, altered diet and fluid intakes, under stress, with a history of constipation are at high risk for acute constipation.
- Patients who are a high risk for acute constipation or are receiving tube feeds and have less than one bowel movement every 2 days should be started on a bowel care protocol.

Bowel Regimen

- Relative contraindications to a bowel regimen:
  - Rectal Surgery
  - Abdominal Pain
  - Allergy to bowel regimen medications
  - Neutropenia (ANC < 1000/mm^3)
  - Thrombocytopenia (platelets < 30,000)

- Absolute Contraindication:
  Suspected or confirmed bowel obstruction.

Bowel Regimen

4 Stage Bowel Protocol

- If the patient has had one bowel movement every 2 days, the patient starts at Stage 1 or is under observation only.
- If diarrhea develops, return to Stage 1.

Stage 1

- Patient assessment and rectal exam
- If impacted, manually dis-impact, give soap suds enema once OR bisacodyl 10 mg suppository once a day
- If not impacted, Docusate 100 mg PO or NJFT q 8 hours and Senna 1 tab PO or 5 mL via NJFT every morning
- If no BM, or very small amounts in 24 hours, proceed to Stage 2.

Bowel Regimen

Stage 2

- Add bisacodyl 10 mg suppository once daily, hold if stooling and resume Stage 1.
- If no BM, or very small amounts within 24 hours, proceed to Stage 3.

Stage 3

- Add Milk of Magnesia 30 mL PO every 6 hours or Miralax 17 g PO/NJFT twice daily until then stop. Return to Stage 2.
- If no BM in 24 hours or very small amount, proceed to Stage Four.

Stage 4

- Call and notify MD.
- Obtain an abdominal X-ray.
- Clarify continued therapy for bowel care.

Intolerance Management

Vomiting

- If no OG/NG tube in position, place one and initiate low wall suction.
- If existing OG/NG, check tube function and placement location.
- If in proper position and functional, decrease tube feed rate by 50% and notify physician for further evaluation and work up.
- Ensure patient is having normal bowel elimination.
- If the patient is receiving gastric enteral feeding, consider placing tube post-pyloric.

Intolerance Management

Abdominal Distension

- Perform history and physical exam.
- Maintain current tube feeding rate, but do not advance. If severe distension, stop tube feeding.
- Workup including abdominal X-ray if mild to moderate, or more aggressive workup including laboratory workup, CT scan, and bladder pressure if severe.
- Ensure patient is on bowel regimen to avoid constipation.
- If mild to moderate and distension persists > 24 hrs with no contraindications for continued feeds switch to elemental formula.

If feeding while the patient is on low-dose vasopressors, any increase in distension should prompt holding tube feeds and consideration of bowel ischemia.

Intolerance Management

If the patient develops moderate (3-4 times/24 hrs or 400-600 ml/24 hrs) to severe diarrhea (>4 times/24 hrs or 600 ml/24 hrs) consider the following:

- Review medication record for possible cause.
- Obtain abdominal X-ray to evaluate feeding tube location.
- Consider workup for *Clostridium difficile* infection.
- Monitor fluid and electrolytes.
- Consider starting soluble fiber supplement.
- If no evidence of Clostridium difficile, consider giving 2 mg loperamide after each loose stool.

Fecal Management System for wound care and/or stool management should be based on manufacturer recommendations and only used with the approval from attending surgeon.

Intolerance Management

High OG/NG Tube Output (1200 ml/24 hrs) with OG/NG to continuous suction and feeding via NJFT.

- Stop tube feeds.
- Obtain abdominal X-ray to determine location of the OG/NG tube and NJFT.
  - If not in correct locations, take appropriate actions and resume tube feeds at previous rate.
  - If in appropriate locations, decrease tube feeds by 50% and assess patient's condition.
- Check NG/OG tube aspirate for glucose testing in lab.
  - If glucose > 110, hold tube feeds for 12 hours an re-evaluate.
  - If glucose negative, resume tube feeds at 50% previous rate.

Intolerance Management

- If feeding through OG/NG tube, or if OG/NG tube in place with post pyloric/jejunal feeding tube, check gastric residuals every 4 – 8 hours.
- Reinfuse the entire gastric aspirate or administer an equivalent volume of ½ normal saline.
- If GRV > 300 mL on two consecutive checks, notify physician.
  - ❑ Start erythromycin 250 mg IV or oral every 6 hours or metoclopramide 10 mg IV every 6 hours.
  - ❑ Continue every 4 hour residual check.

PI Monitoring

- **Intent (Expected Outcomes)**

  All patients undergoing laparotomy within 24-48 hours of admission to a Role 3 facility who meet criteria for enteral feeding will have a NJFT placed at the time of surgery.

- **Performance/Adherence Measures**

  All patients requiring laparotomy within 24-48 hours of admission to a Role 3 facility who also meet criteria for enteral feeding had the NJFT placed at the time of surgery.

- **Data Source**
  - ❑ Patient Record
  - ❑ Department of Defense Trauma Registry (DoDTR)

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Appendices

- **Appendix A**: Adult Parenteral Nutrition Order Form
- **Appendix B**: Enteral Nutrition Pocket Reference Guide
- **Appendix C**: Managing Enteral Feeding Intolerance
- **Appendix D**: Additional Information Regarding Off-Label Uses in CPGs

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